

F3141(V)
96-0319-UNI**REMARKS**

Applicants' attorney is still attempting to establish the requisite facts relating to the 102(f) rejection.

Regarding the objection to the term "brittle" under 35 USC 112, first paragraph (also page 2 of the office action) applicants submit that this is described in sufficiently clear terms.

Qualitatively, 'brittleness' is well understood. In order quantitatively to describe a measure of 'brittleness' it is necessary to have an experimental parameter that reflects it. The approach taken by the inventors (see the examples, page 15 of the specification) is standard in the art and is described in the cited Williams & Cawood reference.

The basis of the method is as follows:

When a layer of material is subject to a force that tends to bend the layer, there will be a certain critical thickness of the layer above which it will not bend smoothly but will instead fracture. For a brittle material, this critical thickness is less than for other materials and it can conveniently be measured directly (as values in the order of millimetres will be obtained). For less brittle materials, the critical thickness may be much larger and hence difficult to determine by direct experiment. It can, however, be calculated on the basis of theory from the Young's modulus (which itself can easily be measured); for materials of very low brittleness,

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the calculated value for the critical thickness can be very large, as exemplified by the control sample in present Example III.

As this methodology is well established in the art and described in the cited reference in the text, applicants submit that there is no basis for rejecting the claims under 35 USC 112, first paragraph.

On page 3 onwards of the Office Action, the Examiner maintains the earlier obviousness objections.

The Examiner's argument, in essence, appears to be that both Clemmings and Warren discuss the idea of altering ice cream texture by means of AFPs; whilst they do not relate this to aspect ratio, WO 92/22581 does teach that AFPs affect shape (and hence aspect ratio) so therefore it would have been obvious to use AFPs of desired aspect ratio in ice cream confections to give a desired texture. The Examiner further points out that applicants state in the specification that the skilled person could easily vary conditions to achieve a desired aspect ratio.

Applicants have argued against these obviousness rejections at length in applicants' responses to previous official actions. In particular, applicants have pointed out that whereas antifreeze peptides are known to be suitable in providing a smooth texture, the present invention provides frozen food products having a relatively hard and brittle texture, this remains the basis of applicants' argument.

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Rather than simply repeating their arguments, applicants wish to review once again what is generally known and how the presently claimed invention relates to this.

- (i) Starting with the Clemmings or Warren references (mentioned on page 3 of the office action), we do not dispute that AFPs have been used in the art to improve the 'quality' of frozen foods, including ice cream. To the extent that the effect on the ice cream of incorporating AFPs has been described at all, however, it has only been described as "preserving the smooth, creamy texture" (see Griffith, p387, penultimate paragraph). Clemmings in Example 2 (column 4) makes it clear that the 'anti-freeze protein treated yoghurt resulted in a smoother texture and mouthfeel than that in the yoghurt without AFP'. There has been no suggestion in the art that AFPs might enhance brittleness.
- (ii) It is acknowledged that AFPs are known (from WO 92/22581, for example, to influence the shape and hence the aspect ratio of ice crystals.

Griffith, in figure 1 on page 376, suggests that elongation into a hexagonal bipyramid occurs in the μM range (which equates to approximately 10ppm or 10^{-2} mg/ml). This is further extended in the passage on page 387 in Griffiths and in the conclusions on page 393 which attributes injurious effects on cells to the formation of "spicular ice

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crystals". Both of these observations would equate to increased aspect ratio.

There is no direct evidence as to how, if at all, the effects on texture of incorporating AFPs can be related to any effects on the shape of the ice crystals. This is because where the influence of AFP on texture has been studied, there has been no corresponding investigation of ice crystal shape.

The most that the skilled person could infer from (i) and (ii) above is therefore that increasing the aspect ratio either positively enhances smoothness in the AFP-containing product or at very least does not detract from the expected enhanced smoothness. This teaches away from the presently claimed finding that an increased aspect ratio associated with including AFPs leads to brittleness.

- (iii) As pointed out by the Examiner on page 9 of the Office Action, Arbuckle relates a link between the texture of ice cream and the shape of the ice crystals. Arbuckle does not indicate in what sense the texture is affected or over what range, however, and does not suggest in any way that increasing the aspect ratio would lead to an increase in brittleness.
- (iv) The use of AFPs in a concentration range overlapping that of the present claim has indeed been described before (by Clemmings, as the Examiner points out at the bottom of page 4 of the Office Action. Furthermore, the use of type III

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AFPs present in fish as a food additive is suggested in Griffith (as pointed out at the top of page 5 of the present Action). In neither case, however, has there been any suggestion that enhanced brittleness may be obtained.

The Examiner invokes the concept of 'result effective variables' to argue that as the texture of an ice cream product is known to be dependent on the type and concentration of the AFP and as at higher AFP concentrations, spicular ice formation is known to result, then the claimed brittleness in structure of the present products is not unexpected. Furthermore, the Examiner argues that selection of the AFP type is also a result effective variable as the Griffiths article teaches that the type of antifreeze protein is selected depending upon the range of temperatures used in processing or the desired texture in the end product. Applicants disagree with the conclusions drawn by the Examiner.

It is one thing to suggest that the nature and/or amount of AFP added can be varied in order to generate a desired texture within a reasonable range but quite another to suggest that *any* desired texture is so obtainable. Applicants submit that this is unreasonable; by way of simple analogy, consider – by varying the amount of cornflour in gravy one can vary how thick its texture is but one cannot give it the texture of cornflakes. In the absence of any suggestion in the art that addition of AFPs will enhance brittleness, indeed in the face of clear teaching in the art that the addition of AFPs actually enhances smoothness, it is unreasonable to suggest that the presently claimed invention is obvious.

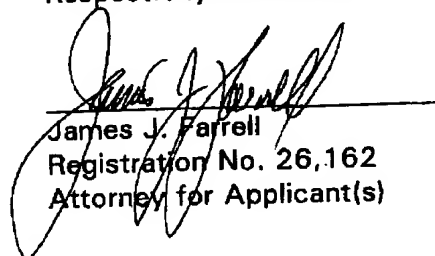
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Although a possible (indirect) link between aspect ratio and texture has been made, no specific teaching as to how to enhance brittleness has been given in the art, nor has the suggestion been made that this *particular* property of texture can be controlled by the aspect ratio.

The Examiner has referred throughout the Office Action to the need for the applicants to show unexpected benefits in order to overcome a prima facie case of obviousness. A prima facie case of obviousness has not in fact, been established as the present finding of enhanced brittleness, in itself, represents an entirely unexpected benefit. Applicants submit that this does not need to be further substantiated with comparative examples.

In view of the foregoing comments, early favorable action is solicited.

Respectfully submitted,



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